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(54) Title: **VEHICLE NAVIGATION SYSTEM WITH PORTABLE PERSONAL COMPUTER**

(57) Abstract: A vehicle navigation system includes a base and a handheld device which is portable relative to the base and dockable to the base. The handheld device includes a GPS receiver, display and user input devices and provides limited navigation capability when detached from the base. The base includes additional databases and navigation sensors which provide a full function navigation system when the handheld device is docked to the base station, including turn-by-turn navigation.

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VEHICLE NAVIGATION SYSTEM WITH PORTABLE PERSONAL COMPUTER

BACKGROUND OF THE INVENTION

5 The present invention relates generally to navigation systems and more particularly to a navigation system having a base station permanently mounted in the car and a handheld device which is portable relative to the base station and provides a subset of functionality apart from the base station.

 Vehicle navigation systems with full functionality, including a full road
10 database and turn-by-turn instructions, etc., are typically installed in a vehicle. Another known navigation system, developed by the assignee of the present invention, is "portable" in that it can be transferred from vehicle to vehicle, but are not really practical to be carried by a user. The known in-vehicle navigation systems are not sufficiently portable to be carried by a hiker. The known navigation systems
15 include user input and output devices for communicating with the user, navigation sensors, such as a GPS receiver, accelerometer, gyros, vehicle speed sensor and other sensors. The navigation system further includes a database of roads and destinations and software for calculating routes from the present position of the vehicle to selected destinations in the database.

20 Handheld GPS receivers comprising a display, input buttons and GPS receiver are also known. These handheld devices are often used for hiking, boating or similar activities, but are insufficient for performing turn-by-turn instructions in a vehicle.

25 **SUMMARY OF THE INVENTION**

 The present invention provides a vehicle navigation system with full functionality, including extended navigation sensors, a full navigation database, turn-by-turn instructions, etc. The vehicle navigation system includes a dockable handheld unit with a display and input devices, a limited database and memory and a
30 GPS receiver.

 While the handheld device is docked on the base, the navigation system indicates turn-by-turn instructions and operates menus on the display on the

handheld device and receives input on the input devices on the handheld device. The navigation system also receives GPS signals from the GPS receiver on the handheld device, preferably as assisted by an antenna in the base.

When the handheld device is removed from the base, the handheld device
5 operates on a rechargeable battery. A CPU and memory calculate the current position of the handheld device based upon signals from the GPS receiver relative to a limited database of roads, terrain or waterway stored on the handheld device. The handheld device may further include communication circuitry, such as cell phone circuitry for providing wireless communication.

10 Thus, the vehicle navigation system of the present invention provides both full featured in-vehicle navigation together with a portable handheld device with limited positioning and navigation capabilities. Further, the handheld device could integrate other features, such as personal digital assistant features, such as contact lists with addresses which could be downloaded to the base or selected as
15 destinations for the calculation of routes by the navigation system, and telephone numbers which could be dialed by the communication circuitry on the handheld device.

BRIEF DESCRIPTION OF THE DRAWINGS

20 Other advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

Figure 1 is a schematic of the navigation system of the present invention installed in a vehicle;

25 Figure 2 is a plan view of the vehicle interface device described by the first embodiment;

Figure 3 is a front view of the vehicle interface device of the first embodiment; and

30 Figure 4 is a plan view of showing of a navigation system with an alternate docking connection.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The navigation system 20 of the present invention is shown schematically in Figure 1 installed in a vehicle's standard radio DIN slot 22 in a dashboard 24 of a vehicle 26. The vehicle navigation system 20 includes a base 28 installed in the
5 DIN slot 22 and a handheld device 30 removably docked to the base 28.

Figure 2 is a plan view of the vehicle navigation system 20. The base 28 includes a CPU 34 connected to memory or storage 36, such as a hard drive, CD-rom, DVD, RAM, ROM or other optically readable magnetic storage or integrated circuit. The memory 36 includes a database 38 including a map of all the roads in
10 the area to be traveled by the vehicle 26. The software for the CPU 34 including the route guidance, operating system, position determining software, etc. may also be stored in memory 36. The base 28 also includes a navigation sensor suite 42 including one or more of a compass 44, altimeter 46, vehicle speed sensor 48, gyro 50, multi-access orthogonal accelerometer 52 and GPS antenna 54. The base 28
15 further includes the typical in-dash systems, such as a radio/cassette/CD/DVD player 58. The base 28 may further include communication circuitry 60 such as cell phone, GSM, etc. The base 28 further includes a connector 62 for connecting to a handheld unit 30.

The handheld unit 30 includes a connector 64 for connecting the handheld
20 unit 30 to the connector 62 of the base 28. The handheld unit 30 further includes a rechargeable battery 66 which is recharged whenever the handheld unit is docked to the base 28. The handheld unit further includes a GPS receiver 68 and may include communication circuitry 70, such as cell phone, GSM, etc. The handheld unit 30 further includes a CPU 72 for performing the functions described herein and
25 memory 74 for storing all necessary data, databases and software. The handheld unit 30 further includes input and output devices, such as a display 78 and speaker 80. Additional input devices 82 are shown in Figure 3 as several buttons are operable by the user. As can be seen further in Figure 3, the base 28 includes additional input devices, such as buttons 86, knobs 88, sliding controls 90, and
30 joystick 92.

The CPUs 34, 72 are suitably programmed (in memory 36/74) to perform all of the functions described herein. One of ordinary skill in the art would be able to provide such suitable programming.

5 In operation, when the handheld device 30 is docked to the base 28, the navigation system 20 is a full featured navigation system. The GPS receiver 68 as assisted by the GPS antenna 54 and the base 28 provides the position signals to the CPU 34. Based upon on this together with the other navigation sensors in the navigation sensor suite 42, the CPU determines the present position of the navigation system 20 relative to the database 38 of roads stored in memory 36. The
10 display 78 of the handheld device 30 is also used by the base 28 for displaying menus and other information during operation of the entertainment systems, such as the radio/cassette/cd/dvd player 58.

Preferably, the handheld device also provide personal digital assistant features, such as storing contact lists including addresses and telephone numbers.
15 The addresses from the handheld device 30 can be downloaded to the memory 36 of the base 28. These addresses can then be chosen in the navigation system 20 utilizing input devices 82. The navigation system 20 then calculates a route to the chosen destination in a known manner and displays turn-by-turn instructions on display 78. In this manner, the selection of destinations in the database 38 of the
20 navigation system 20 is facilitated.

Handheld device 30 is removable from the base station 28 and provides limited functionality without the base station 28. The CPU 72 can calculate the position of the handheld device utilizing the GPS receiver 68. The handheld device 30 also provide limited navigation, including waypoint navigation, utilizing the
25 display 78 and a limited database in memory 74. The handheld device 30 is also operable as a cell phone and PDA when apart from the base 28.

The navigation system 20 of the present invention provides a full-featured vehicle navigation system 20 when the handheld device 30 is docked, a limited functionality portable handheld device 30 with navigation, PDA and cell phone
30 features, and an entertainment system with a display 78 shared with the navigation system 20. The navigation system 20 can be installed into an existing DIN slot 22 on a vehicle 22 dashboard 24, thus facilitating installation.

Figure 4 shows the navigation system of the present invention with an alternate connector 100 that is retractable and extendable forward from the base 28 for connecting to the handheld device 30.

In accordance with the provisions of the patent statutes and jurisprudence, 5 exemplary configurations described above are considered to represent a preferred embodiment of the invention. However, it should be noted that the invention can be practiced otherwise than as specifically illustrated and described without departing from its spirit or scope. As is known, the database could be provided remotely from the vehicle via wireless communication. The GPS receiver could be replaced by 10 other known position-determining systems, such as those used with cell phone technology or other triangulating systems.

CLAIMS

1. A navigation system comprising:
a base including at least one navigation sensor;
5 a portable device selectively in communication with the base, said portable device including a power supply, a display and a position-determining receiver.
2. The navigation system of claim 1 wherein said base is adapted to be
10 installed in a DIN slot of a vehicle.
3. The navigation system of claim 2 wherein said base is installed in a DIN slot of a vehicle.
- 15 4. The navigation system of claim 3 wherein the base includes an accelerometer.
5. The navigation system of claim 4 wherein the base includes a
20 database of roads.
6. The navigation system of claim 5 wherein the portable device includes a processor and memory.
7. The navigation system of claim 6 wherein the portable device
25 includes a GPS receiver.
8. The navigation system of claim 7 wherein the base includes a cd player, the display of the portable device providing a user interface for operating the cd player when the portable device is in communication with the base.
30
9. The navigation system of claim 1 wherein the base includes a connector for selectively connecting to the portable device.

10. The navigation system of claim 1 wherein the portable device includes cell phone circuitry.

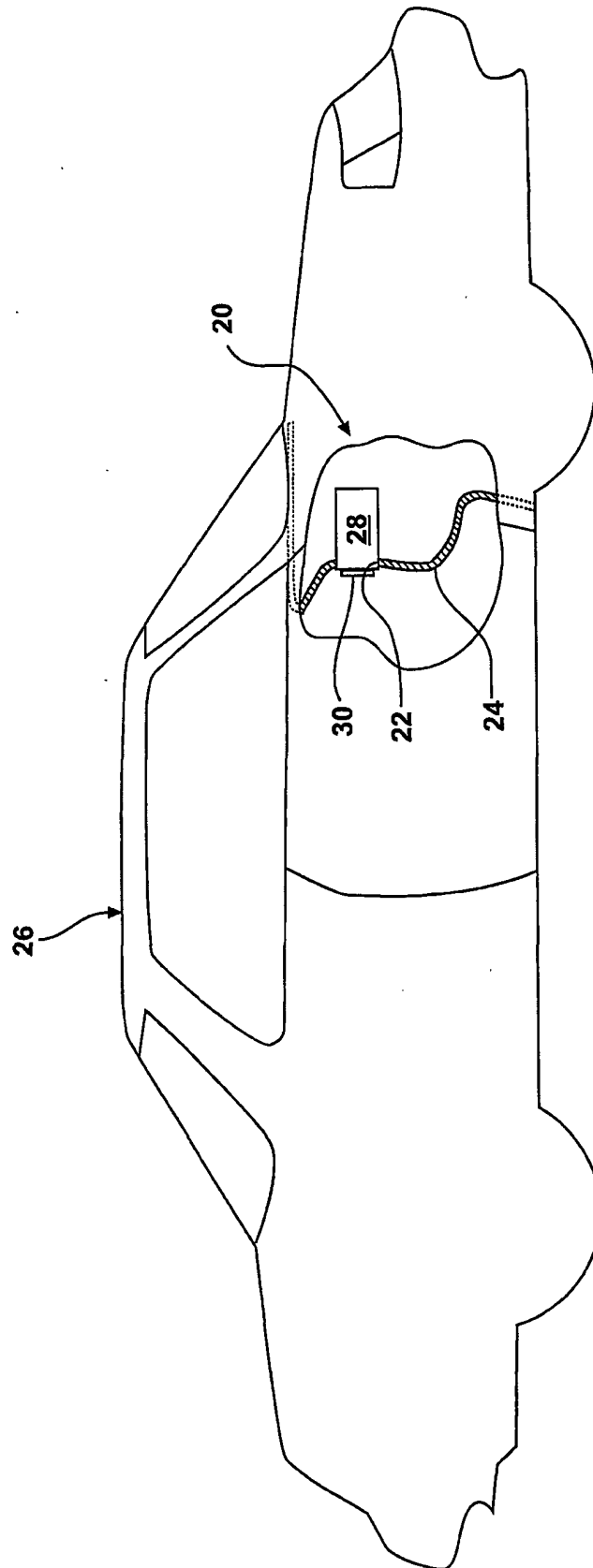


FIG - 1

FIG - 2

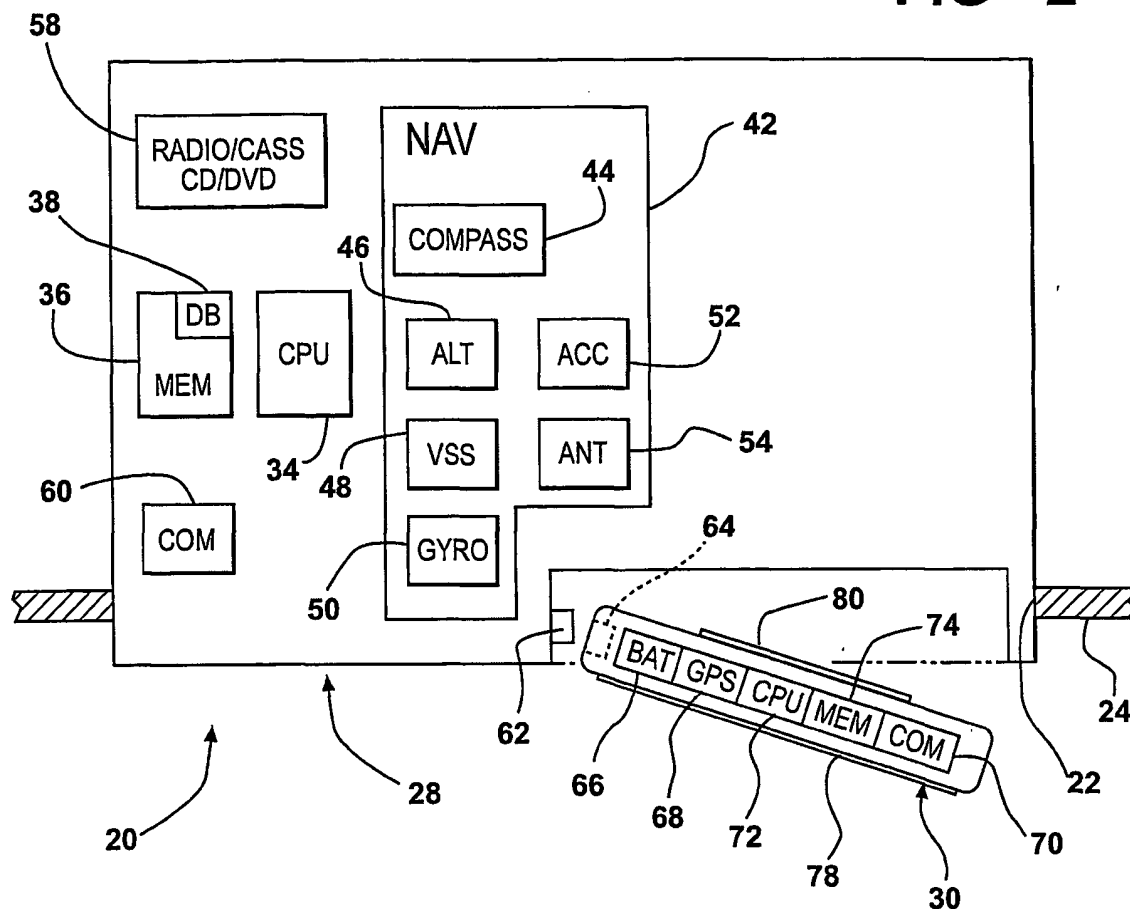
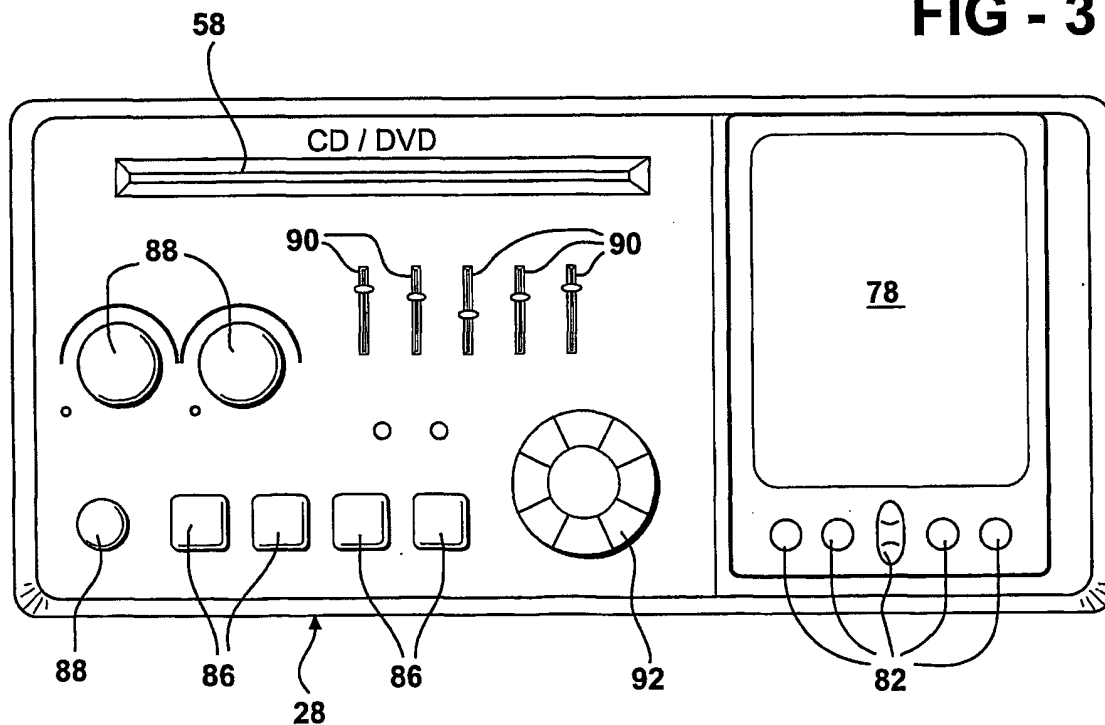


FIG - 3



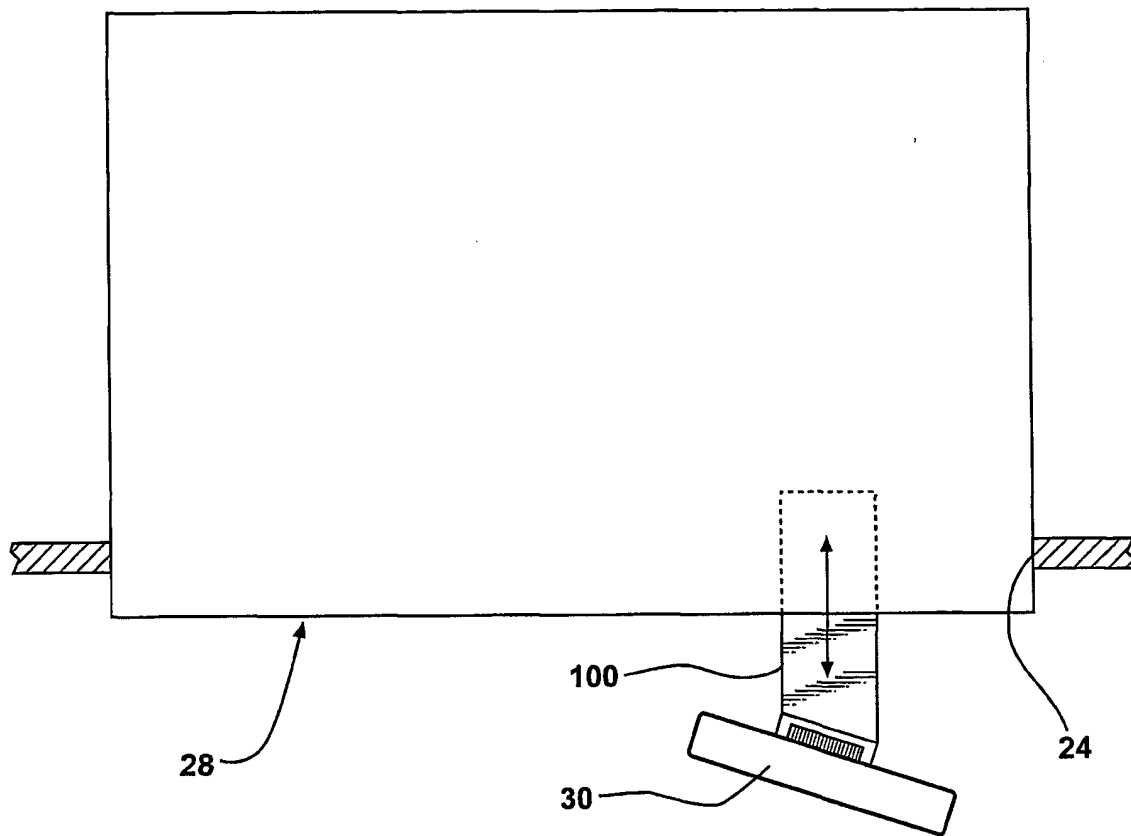


FIG - 4

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 02/10520

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G08G1/0968 G01C21/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G08G G01C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	DE 198 48 192 A (VOLKSWAGENWERK AG) 27 April 2000 (2000-04-27) column 3, line 27 - line 65	1-10
A	EP 1 005 006 A (LEAR AUTOMOTIVE DEARBORN INC) 31 May 2000 (2000-05-31) paragraphs '0005!', '0011!', '0012!'; figures 1, 2	1-10
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A	US 5 760 742 A (JANKY JAMES M ET AL) 2 June 1998 (1998-06-02) column 3, line 30 - line 52 column 8, line 47 - column 9, line 50	1-10
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

Int ☐ al Application No

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Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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